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United States  
Department of  
Agriculture

Forest  
Service

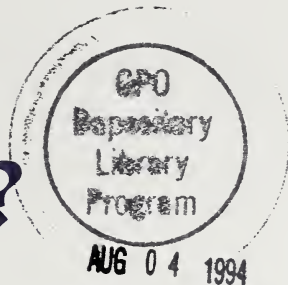


United States  
Department of  
Interior

Bureau of Land  
Management



# Macro What?



## NATIONAL AQUATIC ECOSYSTEM MONITORING CENTER MACROINVERTEBRATE PROGRAM



# Clean Water

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As the use of our natural resources increases, the impact of activities such as:

- Road construction and maintenance
- Hunting, fishing, camping
- Timber harvesting
- Grazing needs
- Expanded energy explorations

have placed an added interest on the water quality of mountain lakes and streams.

In order to measure the effect of these activities on waters leaving National Forest boundaries, a relatively new and reliable tool has been developed.

Aquatic Macroinvertebrate Analysis, or in everyday terms, the study of water insects, has shed new light on techniques for monitoring stream conditions.

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# Insects

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## THERE ARE THOSE INSECTS:

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■ who thrive best in clean water, such as the Mayfly, *Epeorus* sp.

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■ who flourish with a moderate amount of pollution present, such as the Stonefly, *Hesperoperla* Sp.

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■ who live mainly in highly contaminated waters, such as the Blackfly, *Simuliidae*.

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The majority of macroinvertebrates studied make their home in the rocks of stream beds. Preliminary studies have shown researchers that one of three types of insect will generally dominate a given community.

By taking controlled samples of these insects from their natural habitat, the Forest Service has been able to develop a clearer picture of a stream's general "health" in terms of habitability and strength of the aquatic food chain.

Samples are collected spring, summer, and fall over a period of 3 to 5 years.

Over 800 sample sites are now located on 69 National Forests and 28 BLM Districts in 17 states.

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# How it's Done

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Sample sites are selected from representative streams throughout the mountain regions.



A specially designed net called a Surber Net is used to collect the colony of insects who live on the river rocks.



The insect samples are strained and bottled. They are labeled as to date and location and sent to an aquatic ecosystem analysis lab.



At the lab the samples are examined under a dissecting microscope to determine the number of each insect species. The samples are dried and weighed.

Careful records of counts and weights for each sample at each location are compiled.

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# How it Works

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An average sample will consist of about 400 insects, representing a cross-section of about 20 different varieties.

Four hundred macroinvertebrates may seem like a healthy number of insects at first glance, but closer observation tells the real story.

## THE KEY IS HOW MANY OF EACH KIND



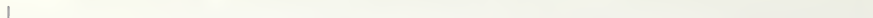
CLEAN WATER SAMPLE




MODERATE SAMPLE



POLLUTED SAMPLE



AVERAGE SAMPLE OF 400 INSECTS

☐ clean water insects       moderately tolerant insects      ☒ polluted water insects

From the results of the analysis, land managers can often tell what type of land use activities are occurring on a stream they have never seen.

For example, the count can show if abandoned mining operations could be releasing traces of heavy metals into the water. Managers can also tell if livestock are grazing along the stream banks and to what extent. The samples can predict whether or not seepage from recreation areas or campgrounds could present a problem to the watershed.

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# Why Bother?

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The macroinvertebrate analysis programs began in 1973. Before then, chemical and physical testing were the major sources of water quality information. Although accurate for many situations, chemical and physical analysis alone didn't give enough biological information to predict long-range effects or to monitor change over time.

Results of macroinvertebrate analysis can provide technical data to land managers that can be helpful in formulating management techniques and alternatives.

## Some Uses

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**PUBLIC LAW** now requires government agencies to know the quality of waters on lands they manage.

**DATA COLLECTED** can be used to evaluate the effects of present and future forest uses.

**THE TYPES** of macroinvertebrates present can be helpful in evaluating a stream's fishery potential.

**DATA CAN** be used to evaluate various management techniques such as those used to control the effects of cattle grazing upon the stream habitat.

